

**WHAT IS CLAIMED IS:**

1. A method for measuring scattering of an optical medium, comprising:
  - acquiring a plurality of point spread functions of the medium, each point spread
  - 5 function comprising a component due to optical aberration of the medium
  - and a component due to scatter;
  - determining the component due to optical aberration; and
  - determining the component due to scatter.
- 10 2. The method of claim 1, wherein the acquiring comprises acquiring a Hartmann-Shack image.
3. The method of claim 1, further comprising generating a display of the scattering of the
- 15 medium.
4. The method of claim 1, wherein the medium comprises an eye.
5. The method of claim 4, further comprising identifying a defect of the eye using the
- 20 component due to scatter, the defect contributing to local scattering.
6. The method of claim 5, wherein the defect comprises a cataract.
7. The method of claim 5, wherein the defect comprises an abnormality of a tear film, a
- 25 corneal scar, a vacuole, edema, a foreign body, an abnormality of a lens, an abnormality
- of the vitreous, drusen, defective contact lenses, defective spectacle lenses, IOL, or any
- combination thereof.
8. The method of claim 5, further comprising treating the defect.
- 30 9. The method of claim 5, wherein the identifying a defect comprises identifying a defect
- before or after laser eye surgery.

10. A method for displaying local scattering characteristics of an optical medium, comprising:

acquiring a Hartmann-Shack calibration image of a measurement system to define a first plurality of point spread functions;

5 acquiring a Hartmann-Shack test image of the medium to define a second plurality of point spread functions;

determining a shift between the test image and the calibration image;

measuring a point spread of each of the second plurality of point spread functions, each of second plurality of point spread functions comprising a component due to optical aberration of the medium and a component due to scatter;

10 determining the component due to optical aberration using the shift;

deconvolving the component due to optical aberration to determine the component due to scatter; and

15 generating a display of the local scattering characteristics using the component due to scatter.

11. The method of claim 10, wherein the medium comprises an eye.

12. The method of claim 11, further comprising identifying a defect of the eye using the component due to scatter, the defect contributing to local scattering.

13. The method of claim 12, wherein the defect comprises a cataract.

14. The method of claim 12, wherein the defect comprises an abnormality of a tear film, a corneal scar, a vacuole, edema, a foreign body, an abnormality of a lens, an abnormality of the vitreous, drusen, defective contact lenses, defective spectacle lenses, IOL, or any combination thereof.

15. The method of claim 12, further comprising treating the defect.

16. The method of claim 12, wherein the identifying a defect comprises identifying a defect before or after laser eye surgery.

17. A system for measuring scattering of an optical medium, comprising:

- 5           an imaging device configured to acquire a plurality of point spread functions of the medium, each point spread function comprising a component due to optical aberration of the medium and a component due to scatter;
- a memory configured to store information corresponding to the plurality of point spread functions;
- 10          a microprocessor in communication with the memory and configured to perform instructions using the information, the instructions including:
- determining the component due to optical aberration; and
- determining the component due to scatter.

15   18. The system of claim 17, wherein the imaging device comprises a Hartmann-Shack wavefront sensor.

19. The system of claim 17, wherein each point spread function further comprises a component due to optical aberration of a measurement system, and wherein the

20   instructions further include determining the component due to optical aberration of the measurement system.

20. The system of claim 17, the instructions further including generating a display of the scattering of the medium.

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21. The system of claim 17, wherein the medium comprises an eye.

22. The system of claim 21, the instructions further including identifying a defect of the eye using the component due to scatter, the defect contributing to local scattering.

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23. The system of claim 22, wherein the defect comprises a cataract.

24. The system of claim 22, wherein the defect comprises an abnormality of a tear film, a corneal scar, a vacuole, edema, a foreign body, an abnormality of a lens, an abnormality of the vitreous, drusen, defective contact lenses, defective spectacle lenses, IOL, or any combination thereof.

25. The system of claim 22, wherein the identifying a defect comprises identifying a defect before or after laser eye surgery.

26. A computer readable media containing program instructions for measuring scattering of an optical medium, the computer readable media comprising:

instructions for measuring a point spread of each of a plurality of point spread functions, each of the point spread functions comprising a component due to optical aberration of the medium and a component due to scatter;

instructions for determining the component due to optical aberration; and  
instructions for determining the component due to scatter.

27. The media of claim 26, wherein each point spread function further comprises a component due to optical aberration of a measurement system, and wherein the media further comprises instructions for determining the component due to optical aberration of the measurement system.

28. The media of claim 27, wherein the instructions for determining the component due to scatter comprise instructions for deconvolving the components due to optical aberration of the medium and of the measurement system from the component due to scatter.

29. The media of claim 26, the media further comprising instructions for generating a display of the scattering of the medium.

30. The media of claim 26, wherein the medium comprises an eye.

31. The media of claim 30, the media further comprising instructions for identifying a defect of the eye using the component due to scatter, the defect contributing to local scattering.

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32. The media of claim 31, wherein the defect comprises a cataract.

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33. The media of claim 31, wherein the defect comprises an abnormality of a tear film, a corneal scar, a vacuole, edema, a foreign body, an abnormality of a lens, an abnormality of the vitreous, drusen, defective contact lenses, defective spectacle lenses, IOL, or any combination thereof.

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34. The media of claim 31, wherein the identifying a defect comprises identifying a defect before or after laser eye surgery.

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35. A method for identifying a defect of an eye, the method comprising:  
acquiring a plurality of point spread functions of the eye, each point spread function comprising a component due to optical aberration of the medium and a component due to scatter;  
determining the component due to optical aberration;  
determining the component due to scatter;  
identifying the defect using the component due to scatter.

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36. The method of claim 35, further comprising treating the defect.

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37. A method for identifying a defect of an eye, comprising:  
acquiring a Hartmann-Shack calibration image of a measurement system to define a first plurality of point spread functions;  
acquiring a Hartmann-Shack image of the eye to define a second plurality of point spread functions;  
determining a shift between the image of the eye and the calibration image;

measuring a point spread of each of the second plurality of point spread functions,  
each of second plurality of point spread functions comprising a component  
due to optical aberration of the medium and a component due to scatter;  
determining the component due to optical aberration using the shift;  
5 deconvolving the component due to optical aberration to determine the  
component due to scatter; and  
identifying the defect using the component due to scatter.

10 38. The method of claim 37, further comprising treating the defect.

39. A method for measuring absorption of an optical medium, comprising:  
acquiring a plurality of spot intensity measurements of the medium, each spot  
intensity measurement comprising a component due to reflectivity and a  
component due to absorption;  
15 determining the component due to reflectivity; and  
determining the component due to absorption.

20 40. The method of claim 39, wherein the acquiring comprises acquiring a Hartmann-Shack image.

41. The method of claim 39, further comprising generating a display of the absorption of the medium.

25 42. The method of claim 39, wherein the medium comprises an eye.

43. The method of claim 42, further comprising identifying a defect of the eye using the component due to absorption, the defect contributing to local scattering.

30 44. The method of claim 43, wherein the defect comprises a cataract.

45. The method of claim 43, further comprising treating the defect.

46. The method of claim 43, wherein the identifying a defect comprises identifying a defect before or after laser eye surgery.
- 5     47. The method of claim 39, wherein determining the component due to reflectivity comprises determining a Stiles-Crawford function.